

Faculty Working Papers

**A COST-EFFECTIVENESS ANALYSIS
OF SHARED LABORATORY SERVICES**

David A. Dittman, Northwestern University

and

Ronald D. Picur, University of Illinois

#199

**College of Commerce and Business Administration
University of Illinois at Urbana-Champaign**

FACULTY WORKING PAPERS

College of Commerce and Business Administration

University of Illinois at Urbana-Champaign

August 21, 1974

A COST-EFFECTIVENESS ANALYSIS
OF SHARED LABORATORY SERVICES

David A. Dittman, Northwestern University

and

Ronald D. Picur, University of Illinois

#199

UNITED STATES DEPARTMENT OF AGRICULTURE

OFFICE OF THE ASSISTANT SECRETARY FOR TECHNICAL ASSISTANCE

WASHINGTON, D. C. 20250

January 1, 1964

Mr. J. B. ...

Dear Sir:

I am pleased to inform you that the ...

... of the ...

Very truly yours,

A COST-EFFECTIVENESS
ANALYSIS OF SHARED
LABORATORY SERVICES*

by

David A. Dittman, Assistant Professor of Accounting and
Health Care Systems, Northwestern University, 2001
Sheridan Road, Evanston, Illinois 60201

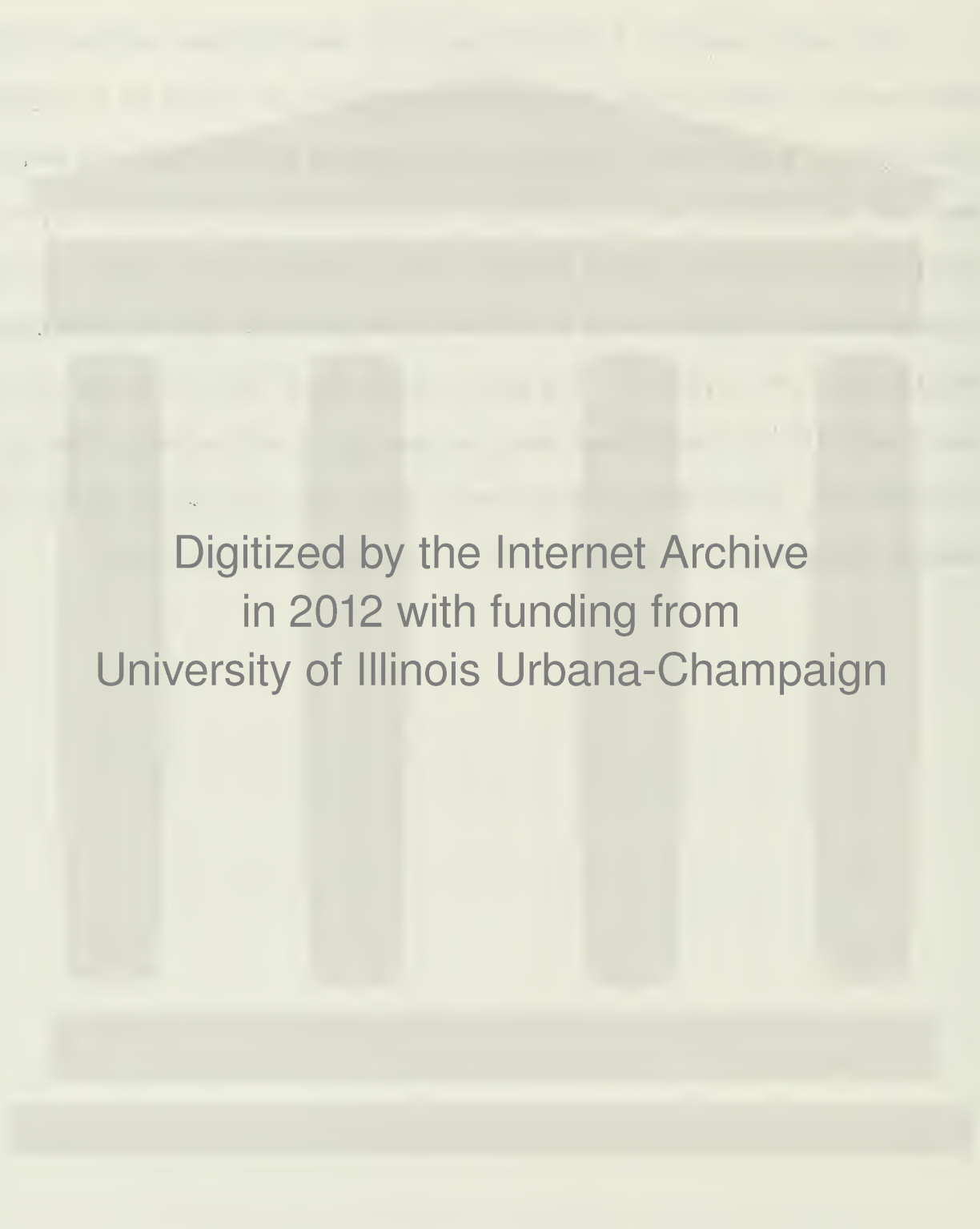
Ronald D. Picur, Assistant Professor of Accountancy,
University of Illinois, 270 Commerce West, Urbana,
Illinois 61801

August 1974

*Support for this research was provided through DHEW contract
HSM 110-70-409 in conjunction with the Health Services Research
Center, Chicago, Illinois.

ABSTRACT

This paper presents a methodology that demonstrates whether shared services via consolidation will create economies of scale in a clinical laboratory. A case study approach was employed and as such the environment and methodology were specified. The findings of the macro study phase depict that small cost savings were effected in the short run by consolidation, though due to a limited time frame no test of statistical significance was feasible. The micro study found that while in the short run statistically significant cost savings could not be found for specific laboratories, significant savings were found for specialized tests and general administrative expenses (i.e., the general laboratory).



Digitized by the Internet Archive
in 2012 with funding from
University of Illinois Urbana-Champaign

I) INTRODUCTION

The concept of shared services has provided the health care industry an alternative manner to organize their factors of production which theoretically should provide cost savings by merger into a new organization, thus providing economies of scale over smaller individual operation. The case study described in this paper evaluates the cost structure (pre- and post-consolidation) that resulted from the consolidation of two hospitals' clinical laboratories into a single organizational unit. The objective of this study is to present a methodology which can be used to empirically demonstrate whether or not such economies of scale materialize in a health care setting through the introduction of shared services.

II) THEORETICAL FOUNDATION

A priori one theoretically expects cost savings to result from a consolidation of separate clinical laboratory facilities. This expectation is founded upon the classical notion of economies of scale. Briefly stated, this concept suggests that as a production unit increases in size, average cost per unit output will decrease. This phenomenon of increased efficiency is typically attributable to two major factors: 1) increased specialization and division of labor, and 2) increased capability to introduce technological innovations. (4)

In a clinical laboratory setting both of these factors are particularly relevant. In today's modern laboratory a vast plethora of highly specialized test procedures can be found. Literally hundreds of different categories of tests are processed every day. But it would indeed be rare to find a given hospital which could afford the luxury of employing tech-

nicians who specialize in processing only one or two categories of tests. In fact, a typical technician is expected to have a broad background so as to assure the needed flexibility necessary in such an environment. Clearly, the utilization of shared services via consolidation conceptually promotes greater speculation and division of labor and hence increased efficiency.

Similarly, technological advances in the area of automated analysis has taken great strides forward in recent years (e.g., autoanalyzers, Coulter S, etc). Yet an individual laboratory may well be hard-pressed to economically justify such a capital expenditure to a cost-conscious hospital administrator. Consolidation conceptually creates an environment where such an expenditure can be better justified due to a greater utilization a consolidated laboratory should realize. Here again, one finds shared services promoting efficiency and hence economies of scale.

The interface of these cost savings factors in a hospital laboratory can be represented graphically. The figures depicted below represent hypothetical short run average cost curves (SAC) for a specific test category before consolidation (Figures 1a and 1b) and after consolidation (Figure 1c).

Figure 1

If economies of scale materialize the average cost (AC_3) of producing quantity q_3 (where $q_3 = q_1 + q_2$) in the consolidated laboratory should be less than the sum of the two individual laboratories preconsolidation average costs -- i.e., $AC_3 < AC_1 + AC_2$. It should also be noted that while this discussion has centered on individual test categories a similar

analysis can also be extended to all tests processed within a specific laboratory before and after consolidation.

Based on this theoretical representation a research methodology was constructed to collect data from the case study presented herein to empirically evaluate if such cost savings were in fact affected. Given the case study nature of this research a brief description of the environment will be set forth.

III) THE ENVIRONMENT

A) Overview

On September 1, 1972, Chicago Wesley Memorial Hospital and Chicago Passavant Memorial Hospital were legally consolidated into a new entity -- Chicago Northwestern Memorial Hospital. Approximately two years prior to this total merger the clinical laboratories at both institutions had been committed to a formal plan of consolidation under the auspices of a new organizational entity which was to be legally separate from the existing institutions. Accordingly, upon the agreement to consolidate the two hospitals, the necessity of the separate legal entity was eliminated since the clinical laboratories would be consolidated under the newly created Northwestern Memorial Hospital. Hence, while some of the foundational planning (i.e., primarily the legal aspects) necessary for consolidating the laboratories was fruitless, all of the modifications which had been scheduled for implementation could be operationalized in a relatively short time span.

This set of circumstances was crucial to the selection of the clinical

laboratories for this study. It was due to the aforementioned prior agreement and associated planning on the part of the clinical laboratories' administrative and operating staffs that the physical consolidation of several laboratories was a reality before other functional units in the new entity could be consolidated. As such, a sufficient amount of data relating to the cost structures of these select laboratories has been collected, evaluated and is reported upon in this study. (1)

One caveat must be offered. Even though certain clinical laboratories have been consolidated, this study nevertheless is constrained to reporting the short-run effects of such a consolidation. That is, one of the cost-saving measures normally associated with shared services have not had sufficient time to be effected. Specifically, a policy decision was reached to announce to laboratory personnel that no jobs would be lost due to consolidation. This decision was based on the knowledge that a significant time lag would exist between the plan's announcement and implementation. A period during which administrators feared that poor morale and low productivity would result if termination were associated with the consolidations. Hence, attrition was to be utilized to effect cost-savings. Clearly, since labor represents the largest single cost component of a typical laboratory this decision had an impact upon the findings of this study. That is, a certain amount of duplication of services was not eliminated in the short run. However, since this potential motivational problem is one which all institutions must face, when shared services are created via the consolidation format, the results reported herein can reasonably be expected to depict the cost impact of any such

consolidation in the short-run.

B) Accounting Systems

Since the objective of this study is to investigate the cost impact of consolidation the accounting systems found in the participating institutions represent major environmental factors which must be identified. Ideally an accounting system should segregate laboratory costs for each major category of tests. Such a classification scheme would permit detailed comparisons of individual tests before and after consolidation in order to identify any resultant cost savings.¹ Practically an accounting system which captures costs on such a basis is infeasible from several standpoints. First, there is an administrative cost of collecting and processing the various costs (labor and material) for each group of tests. Second, in many laboratories technicians will actually process several different types of tests frequently moving back and forth between the different processes. Accordingly, daily estimates of time spent on a given category of tests would be the only feasible method of measuring the labor cost input to the individual processes and might well prove inaccurate. Finally, many laboratories interchange technicians who process a given test category on a daily basis. As such, one day might find a senior technician processing a given test who earns \$5.00 per hour while the next day a new technician earning but \$3.00 per hour would be assigned to the same process. Clearly, the validity of cost comparisons on a per test basis would be highly suspect in such an environment. Given the limitations of a detailed cost accounting system most hospitals (including Wesley and Passavant) utilize a much broader scoped classification system. Passavant captured

costs on a "responsibility center" basis. That is, each individual laboratory was designated a "responsibility center" and test volume, revenues and expenses were collected and identified by the specific laboratory -- (e.g., chemistry, hematology, bacteriology, etc.) Wesley, prior to consolidation did not employ the "responsibility center" concept of cost classification. Rather costs were simply categorized by their nature (e.g., labor, chemicals, etc.) and not the organizational unit responsible for incurring such costs. In addition Wesley's accounting system was primarily on a "cash" basis. Proper accounting (termed "accrual" accounting) suggests that expenditures (i.e., cash outlays) be "matched" with the benefits then generated and "matched" to the time period in which the benefits were received. A "cash" basis accounting system creates several major problems by not attempting to "match" such events. For example, a laboratory typically inventories certain supplies and materials and uses them over a given time period (e.g., three or four months). But the expense is recognized when the cash expenditure is made. The result is to create large monthly fluctuations in costs even though the services are provided relatively uniformly. A second problem related to labor expense. The majority of the technicians at Wesley were paid every two weeks. Under "cash" basis accounting the expense was recorded when the outlay was made. The result being that in some calendar months (which was the basic accounting period) three pay periods occurred while in others only two pay periods were found. Again the effect was to overstate costs vis a vis benefits in some months and understate costs in others.

IV) METHODOLOGY

A) Limitations

While the basic methodology utilized attempted to duplicate the average cost analysis identified earlier in this paper several modifications were necessary. First, as described beforehand, the accounting systems at the participating institutions did not capture costs by specific test category. As such, the average cost analysis could not be directly applied. As an alternative the researchers suggested the use of a "work sampling" process. (2,3) This proposal was rejected by the pathology staffs of the participating institutions on the basis that laboratory routing would be disrupted. While literature in the area does not support this viewpoint the researchers had to operate within the constraints of the given environment. (5)

A second cause for modifications was also due to the nature of the accounting systems. Since Wesley had not historically collected cost data on a responsibility center basis no historical pre-consolidation data could be gathered for individual laboratories. Hence, a longitudinal comparison of individual laboratories' cost structures would be limited to data collected after the researchers entered the project.

With these limitations in mind the researchers were confronted with the need to develop an alternative methodology which would compare the cost pre- and post-consolidation. Any measure which did not relate factor prices to actual output would fail due to changes in scale from ordinary growth. Also any output measure which failed to allow for changes in relative mix of outputs would fail since the results would be confounded by changes in the mix of test over time. The "relative value unit" of the

American College of Pathologist was chosen to surrogate output since it provided a commensurable measure for all laboratory tests, allowed for changing technology and mix over time, was adopted by both hospitals' pathologist as a measure of output.² The cost-effectiveness of the consolidation is evaluated by comparing the cost per relative value unit for various operating segments of the clinical laboratory. This cost-effectiveness measure was chosen for several reasons. First, it provided a measure to compare the interface between the cost of the factor inputs with the outputs of various laboratories over time both before and after consolidation. Second, the relative value unit measure is a measure of output which is known and understood by health professionals. Third, the measurement of cost can be ascertained directly from an organization's accounting system. The method of cost collection and aggregation is a major factor in the implementation of the cost-effectiveness analysis.

The ways in which this methodology was implemented will now be investigated.

B) The Macro Study

Briefly stated, this methodology was designed to consolidate both accounting records and test volume of Wesley and Passavant's laboratories on a pro-forma fiscal year basis. Total costs would simply be aggregated with no assignment to individual laboratories. This decision (not to allocate costs) was not a matter of choice but rather circumstance. That is, Wesley had not historically assigned costs on a "responsibility center" basis and no technique existed to recast the earlier cost data. The test volume was transformed into common units by use of a weighting factor (i.e.,

the "relative value unit"). Individual pro-forma expense categories (both direct and indirect) and total expense were divided by total relative value units for each year of the study. The resulting cost-per-unit indexes were to be evaluated by various statistical techniques through a longitudinal study (pre-consolidation versus post-consolidation).

The actual methodology to implement the basic concept described above included six stages. (The same basic methodology was utilized for both the pre- and post-consolidation data other than the post-consolidation data did not require on a pro-forma basis.) Stage one was termed the data collection phase. Several major data inputs for each year of the study were collected during this phase.

These included:

1. Expense reports (for each institution):
 - a. Direct expenses -- by category
 - b. Indirect expenses -- by category
2. Test volume figures (for each institution) -- by category
3. Relative value schedules -- by test category

The second stage was termed the Pro-Forma Data Consolidation phase. Consolidation of cost and volume data was necessary for post-consolidation comparison purposes, since at that time only one set of expense reports would be generated. The consolidation can be represented symbolically as follows:

- (1) Let:
- | | |
|----|---|
| i | = Specific expense category (e.g., labor |
| j | = Specific test category (e.g., RBC's) |
| n | = Time period (e.g., fiscal year 1971) |
| k | = Total number of direct expense categories |
| m | = Total number of indirect expense categories |
| PF | = Pro Forma |

W = Wesley Memorial Hospital
 P = Passavant Memorial Hospital
 d_{in} = Specific direct expense i for period n
 id_{in} = Specific indirect expense i for period n
 td_n = Total direct expenses for period n
 tid_n = Total indirect expenses for n
 te_n = Total expenses (direct and indirect) for period n
 v_{jn} = Total volume for specific test j for period n

(2) Then:

(a) Consolidated pro forma expenses were calculated as follows:

$$(aa) \quad d_{PF_{in}} = d_{W_{in}} + d_{P_{in}} \text{ for each } i \text{ and } n$$

$$(bb) \quad id_{PF_{in}} = id_{W_{in}} + id_{P_{in}} \text{ for each } i \text{ and } n$$

$$(cc) \quad td_{PF_n} = \sum_{i=1}^k id_{PF_{in}} \text{ for each } n$$

$$(dd) \quad tid_{PF_n} = \sum_{i=1}^m id_{PF_{in}} \text{ for each } n$$

(b) Consolidated pro forma test volumes (for each test category) were calculated as follows:

$$v_{PF_{jn}} = v_{W_{jn}} + v_{P_{jn}} \text{ for each } j \text{ and } n$$

The third stage comprised the Price - level Adjustment of Cost Data.

That is, in order to assure comparability over time the pro forma expenses were then price level adjusted to eliminate the impact of inflation.

Using 1968 as a base year this phase deflated all subsequent year's expenses to 1968 dollars using the GNP implicit price deflator. (NOTE: All future references to costs will assume price deflated costs.)

Upon pro forma consolidation and price level adjustment of expenses and test volume on an annual basis, the fourth stage involved the calculation of total weighted relative value units. The weighting process comprised multiplying total test volume for each test category during a given time period by its respective relative value unit. Utilizing the symbols from above.

- (1) Let: rvu_{jn} = relative value unit for test j during time period n
 twu_{jn} = total weighted units for test j during time period n
 twu_n = total weighted units for time period n

- (2) Then: (a) $twu_{PFjn} = (v_{Wjn}) (rvu_{Wjn}) + (v_{Pjn}) (rvu_{Pjn})$

for each j and n

- (b) $twu_{PFn} = \sum_{i=1}^L twu_{PFjn}$ for each n

Having calculated pro forma expenses and weighted units on a yearly basis, the fifth stage was the analysis phase. Each component of price deflated direct and indirect expense, in addition to the total expense for the year (direct plus indirect), was divided by the total weighted units for that year. The result was annual values for various costs per unit output. The analysis phase can be represented as follows:

- (1) Let: du_{in} = total direct expense per relative value unit for specific expense category i and time period n
 idu_{in} = total indirect expenses per relative value unit for specific expense category i and time period n

teu_n = total expenses per relative value unit for time period n

(2) Then:

$$(a) \quad du_{PF_{in}} = \frac{d_{PF_{in}}}{twu_{PF_{in}}} \quad \text{for each } i \text{ and } n$$

$$(b) \quad idu_{PF_{in}} = \frac{id_{PF_{in}}}{twu_{PF_{in}}} \quad \text{for each } i \text{ and } n$$

$$(c) \quad teu_{PF_n} = \sum_{i=1}^k du_{PF_{in}} + \sum_{i=1}^m idu_{PF_{in}} \quad \text{for each } i \text{ and } n$$

B) The Micro Study

The purpose of this study was to assess changes in the direct costs of individual laboratories over time. While the macro study was constrained to studying the cost structure (pre- and post-consolidation of the total laboratory facility the researchers thought a study of specific laboratory cost structures over time would be of greater relevance. Accordingly, upon the initiation of this study the cost and volume reports of Wesley were recast, on a monthly basis, by individual laboratories. This process actually involved creation of a duplicate accounting system that captured costs by the respective responsibility center. These centers included the following laboratories: surgical, pathology, microbiology, blood bank, chemistry, hematology, serology, virology, and the general laboratory. The implementation of this study incorporated six stages.³

The first stage involved the collection of raw data by individual responsibility centers.⁴ These included:

1. Labor expense
2. Materials and supply expense
3. Repairs and maintenance expense
4. Administrative expense
5. Test volume
6. Relative value unit schedules

The second stage, Pro-Forma Consolidation of Direct Expenses, aggregated cost data for each laboratory on a monthly basis.⁵ This process can be expressed as follows:

- (1) Let:
- PF = pro forma direct expense component
 - W = Wesley's direct expense component
 - P = Passavant's direct expense component
 - i = specific direct expense component (e.g., chemicals media, etc.)
 - j = specific laboratory (e.g., bacteriology, hematology, etc.)
 - k = time period (e.g., October, March, etc.)
 - n = number of cost components i
- de_{ijk} = total direct expenses for component i, laboratory j, during time period k
- tde_{jk} = total direct expenses for laboratory j during time period k

(2) Then:

- (a) Consolidation into pro forma expense statements with detail for each direct expense category for each laboratory, and for each month would be represented by:

$$de_{PF_{ijk}} = de_{W_{ijk}} + de_{P_{ijk}} \quad \text{for each } i, j, k$$

- (b) Total direct expenses for each laboratory with detail for each month would be developed by summing all individual expense items as follows:

$$tde_{PF_{jk}} = \sum_{i=1}^n de_{PF_{ijk}} \quad \text{for each } j \text{ and } k$$

As in the macro study the third stage related to a restatement of the pro forma cost data on a price level adjusted basis. Using March 1973 as the base period and the Medical Care Component of the consumer price in-

dex for the Chicago area, all subsequent monthly costs were deflated. (Again all further references to cost data implicitly assumes such data have been price-level adjusted.)

Similarly, the fifth stage, calculation of total relative value units, comprised a summation of all weighted relative value units processed within a specific laboratory. This procedure encompassed the following calculations:

- (1) Let:
- m = Specific Test Category
 - n = Time period
 - j = Specific laboratory
 - k = Number of test categories
- $tv_{PF\ mnj}$ = total pro forma test volume (both institutions)
- rvu_m = relative value unit for test m during time period n
- $trvu_{jn}$ = total relative value units for laboratory j during time period n

- (2) Then:
- $$trvu_{jn} = \sum_{m=1}^P (tv_{PF\ mnj}) (rvu_{mm}) \text{ for each } j \text{ and } n$$

In the fifth stage, after both direct cost elements and total weighted relative value units had been identified on a lab-by-lab basis, the data analysis was carried out by dividing each price-level adjusted expense component for the given laboratory by its respective total relative value units. Symbolically, the analysis can be represented as follows:

- (1) Let:
- i = specific direct expense component (e.g., labor, supplies, maintenance, etc.)
 - j = specific laboratory
 - l = total number of expense components
 - n = time period
 - PF = pro forma
- $de_{PF\ ijn}$ = total direct pro forma expense for expense component i, laboratory j, time period n

tde_{PFjn} = total direct pro forma expenses for laboratory j during time period n

c_{PFijn} = specific direct pro forma expense component i for laboratory j

tc_{PFjn} = total direct pro forma expenses per total relative value units, for laboratory j during time period n

(2) Then:

$$(a) \quad tde_{PFjn} = \sum_{i=1}^L de_{PFijn} \quad \text{for each } j \text{ and } n$$

$$(b) \quad c_{PFijn} = \frac{de_{PFijn}}{trvu_{jn}} \quad \text{for each } i, j, \text{ and } n$$

$$(c) \quad tc_{PFjn} = \frac{tde_{PFjn}}{trvu_{jn}} \quad \text{for each } j \text{ and } n$$

$$(d) \quad tc_{PFjn} = \sum_{i=1}^L c_{PFijn} \quad \text{for each } j \text{ and } n$$

The final stage was that of evaluation. Mean values were calculated (by laboratory) for the cost per relative value units before and after consolidation. Using a "t" test of statistical significance, an analysis was then made to determine if significant cost savings for specific laboratories had been effected.

V) RESULTS, EVALUATION AND CONCLUSIONS

A) The Macro Study

Data was collected for seven fiscal years, 1968 through the first seven months of fiscal 1974.⁶ Unfortunately due to several delays in initiating the consolidation of individual laboratories, no laboratories

were consolidated until late fiscal 1973 and early fiscal 1974.⁷ Hence, a sufficient number of data points do not exist to utilize the standard statistical tests (e.g, "t" test) to evaluate the significance of any resultant changes from consolidation in the cost structure. As such, but two sets of data are included. Table 1 indicates the price-level adjusted cost per relative value unit for the seven years included in the study. Table 2 provides the evaluated data. The actual technique, due to the number of data points was limited to comparisons of percentage changes on a year-to-year basis of the various components identified in Table 1.

Table 1

Table 2

Several observations should be made. Prior to fiscal 1972 a continual upward trend was found in the cost per unit. Since all cost figures had been price level adjusted the effect of inflation in the general economy had already been eliminated. As such the decline in cost per unit which began in fiscal 1972 can be attributed to several factors. First, the decline from fiscal 1971 to fiscal 1972 is primarily due to the Economic Stabilization Act invoked in August 15, 1971. Since fiscal 1972 began on September 1, 1971, it seems reasonable to assume the effect of the act was reflected in the decreased cost per unit. That is, the act imposed considerable pressure upon the health care industry to control costs. Given the 5.52% decrease

in cost per cost, while total relative value units increased only 2.12%, it is clear the policy of cost containment had been implemented.

Second, cost per unit decreased between 1972 and 1973. This phenomenon is attributable to the first stage of consolidation. Even before the two institutions merged in September 1973 a partial laboratory consolidation had already begun. A series of highly specialized tests which Passavant had formally sent to outside laboratories were instead sent to Wesley under a limited consolidation agreement. This change had the effect of lowering total pro forma costs while increasing total relative value units. The net result of this agreement being a decrease in cost per unit. Beyond these specialized tests Passavant also began utilizing the 12 channel autoanalyzer (SMA60) at Wesley for an admission test. Prior to this arrangement Passavant did not require even a mandatory test. This change in policy had the effect of negligibly increasing costs yet vastly increasing relative value units with the net result being a decrease in cost per unit.

The final period of the study, 1973 to 1974, also shows a decrease in cost. Since the only factor impacting on this time period was the actual physical consolidation being implemented the logical conclusion which can be drawn is that cost savings were in fact effected. Of course, due to the limited number of data points no test of statistical significance could be made. But regardless a decrease in cost was found that can not be attributed to any exogeneous factors such as the Economic Stabilization Act.

Briefly summarized the macro study results indicate that cost savings have apparently materialized in the short run through the utilization of

shared services. However, since no tests of statistical significance could be made, it is impossible to state that these results are conclusive.

B) The Micro Study

Fifteen months of data for each individual laboratory was collected. Given the logistical problems of physically relocating specific laboratories, not all of the individual laboratories were consolidated during the period of this study. As such, the results included herein relate solely to those laboratories which had consolidated sufficiently early in the total merger time sequence (between Wesley and Passavant) to collect post-consolidation data.

For those laboratories which did consolidate the mean value of the direct cost for the months before and after consolidation were calculated. In order to determine if the differences between sample means were statistically significant the null hypothesis that there was no difference between the means of the pre- and post-consolidation data was formulated.

$$H_0 : \mu_1 = \mu_2$$

A "t-test" was used to test the statistical significance.

Table 3 provides a description of the laboratories which consolidated the means of the direct cost components per weighted relative value unit, the "t" values and the level of significance.

Table 3

With the exception of the general laboratory, the null hypothesis for all other laboratories could not be rejected. That is, the direct cost per unit indices were not statistically different before and after consolidation.

for the microbiology, chemistry, serology, and blood bank laboratories. Alternatively, the general laboratory (primarily encompassing the out-patient laboratory plus an entire spectrum of highly specialized tests -- in addition to general administrative costs) did show a significant cost savings.

Several conclusions may be drawn from these findings. First, cost savings in the short run were not found for specific laboratories. Doubtless, this phenomenon is a function of the previously mentioned policy decision to decrease labor costs only through attrition and not termination. Such a decision is faced by all administrators planning shared services facilities via the consolidation route and these findings indicate the effect on cost structure when attrition is selected as the appropriate technique. The alternative decision -- termination -- was not chosen and as such no measurable results could be identified.

Second, the aforementioned transference of specialized tests from Passavant (formerly sent to outside consulting laboratories) to Wesley, plus the decrease in general administrative expenses did create a significant cost savings in the general laboratory cost structure. These findings indicate that irrespective of a policy decision against termination (as a labor saving device), cost savings can still be effected in the area of highly specialized and general administrative overhead. Larger batch sizes in such tests resulted in more efficient operations (e.g., less material usage and overtime) with the net effect of lower average cost per relative value unit. Similarly, the consolidation of general administrative tasks eliminated duplication of such services which likewise lowered average costs.

VI) SUMMARY

This study has attempted to demonstrate whether shared services via consolidation will create economies of scale in a clinical laboratory. A case study approach was employed and as such the environment and methodology were specified. The findings of the macro study phase depict that small cost savings were effected in the short run by consolidation, though due to a limited time frame no test of statistical significance was feasible. The micro study found that while in the short run statistically significant cost savings could not be found for specific laboratories, significant savings were found for specialized tests and general administrative expenses (i.e., the general laboratory).

FOOTNOTES

1. For example, many test procedures completed in a laboratory are processed in "batches." For those tests which require a fixed amount of "set-up time" regardless of batch size, increased batch sizes will effectively lower average processing time and hence average cost. One aspect of consolidating laboratories is to achieve such increased batch sizes and resulting lower costs. But in order to perform before and after cost comparisons the relevant costs must obviously be categorized by type of test.
2. Specimens, test procedures, work-load units, and relative value units were considered for use. Specimens and test procedures were rejected since a measure was not available for some test prior to 1970.
3. Again the same basic methodology was employed for both the pre- and post-consolidation data other than post-consolidation data did not require restatement on a pro forma basis.
4. Indirect expenses were not collected for the micro study due to the nature of the allocation process. That is, neither Wesley nor Passavant allocated such expenses to individual laboratories. Rather, such expenses were simply allocated to the clinical laboratory department as a whole.
5. An intermediate step was necessary before the second stage. Since Wesley's accounting system was "cash" basis a series of adjustments was necessitated to restate their expense statements to an "accrual" basis. Since the methodology was fairly detailed and wholly intrinsic to Wesley's accounting records no description has been included.
6. Each fiscal year begins September 1st.
7. As identified earlier this study was conducted under a grant provided by the Department of Health, Education and Welfare, and as such the results reported herein are limited to the data collected during the period of the grant. While the researchers envision collecting additional data to evaluate the long term cost savings effect of consolidation, this paper is primarily oriented towards the short term effects.

REFERENCES

1. Dittman, David A., and Picur, Ronald D., An Evaluation of the Consolidation of the Clinical Laboratory Facilities at Northwestern Memorial Hospital: The Cost Evaluation, Health Services Research Center of the Hospital Research and Educational Trust and Northwestern University, Chicago, Illinois, 1974.
2. Heiland, Robert E., and Richardson, Wallace J., Work Sampling, McGraw-Hill, New York, 1957.
3. Jensen, Robert, and Thompson, C. Torbin, Statistical analysis in cost measurement and control. The Accounting Review, XLIII: 83-93, 1968.
4. Mansfield, Edwin, Micro Economics, W. W. Norton, New York, 1970.
5. Rutherford, Margaret, and Spitzer, Stephen P., Observer effect and hospital interaction. Nursing Research, 17:32-37, 1968.

TABLE 1

THE CONSOLIDATED LABORATORIES
SEVEN YEAR COMPARATIVE SUMMARY--AGGREGATE
PRICE LEVEL ADJUSTED, COST PER RELATIVE VALUE UNIT
TOTAL LABORATORY COST

	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	Seven Months <u>1974</u>
Total Salaries	1.2109	1.2110	1.4868	1.5854	1.4885	1.4089	1.3670
Total Direct (Excluding Salaries)	<u>.6144</u>	<u>.6074</u>	<u>.6224</u>	<u>.7283</u>	<u>.6875</u>	<u>.6681</u>	<u>.6314</u>
Total Direct Expense	<u>1.8253</u>	<u>1.8184</u>	<u>2.1092</u>	<u>2.3137</u>	<u>2.0760</u>	<u>2.0770</u>	<u>1.9984</u>

TABLE 2

COMPARISON OF PERCENTAGE CHANGE IN
COST PER WEIGHTED RELATIVE VALUE UNIT WITH
PERCENTAGE CHANGE IN WEIGHTED RELATIVE VALUE UNITS (WRVU)

	<u>Total Laboratory</u>					
	<u>1968- 1969</u>	<u>1969- 1970</u>	<u>1970- 1971</u>	<u>1971- 1972</u>	<u>1972- 1973</u>	<u>1973- 1974</u>
Salaries/WRVU	.03%	22.77%	6.63%	-6.11%	-5.35%	-2.99%
Direct Expense less Salaries/WRVU	-1.11%	2.47%	17.01%	-5.60%	-2.90%	-5.49%
Total Direct Expense/ WRVU	-.38%	15.99%	9.70%	-10.27%	-4.55%	-3.78%
Weighted Relative Value Units	9.28%	8.49%	3.65%	2.12%	10.61%	5.14%

TABLE 3

SUMMARY OF STATISTICAL TESTS OF
COST STRUCTURES FOR SPECIFIC
LABORATORIES BEFORE AND AFTER
CONSOLIDATION

Laboratory	Mean		Sample Size		t	Significance
	Before	After	Before	After		
<u>General</u>						
Salaries/WRVU	4.171	3.160	8	7	1.981	not significant $\alpha=.05$
(DE-Salaries)/WRVU	4.332	1.163	8	7	3.664	significant $\alpha=.05$
Total DE/WRVU	8.503	4.323	8	7	3.389	significant $\alpha=.05$
<u>Microbiology</u>						
Salaries/WRVU	1.148	1.163	7	7	.500	not significant $\alpha=.05$
(DE-Salaries)/WRVU	.313	.335	7	7	.223	not significant $\alpha=.05$
Total DE/WRVU	1.460	1.497	7	7	.333	not significant $\alpha=.05$
<u>Chemistry</u>						
Salaries/WRVU	.625	.594	8	7	.173	not significant $\alpha=.05$
(DE-Salaries)/WRVU	.673	.754	8	7	.500	not significant $\alpha=.05$
Total DE/WRVU	1.298	1.348	8	7	.926	not significant $\alpha=.05$
<u>Serology</u>						
Salaries/WRVU	1.668	1.818	5	10	2.169	not significant $\alpha=.05$
(DE-Salaries)/WRVU	.484	.752	5	10	.533	not significant $\alpha=.05$
Total DE/WRVU	2.141	2.570	5	10	1.958	not significant $\alpha=.05$
<u>Blood Bank</u>						
Salaries/WRVU	1.939	2.050	8	7	.325	not significant $\alpha=.05$
(DE-Salaries)/WRVU	.538	.517	8	7	.435	not significant $\alpha=.05$
Total DE/WRVU	1.402	1.533	8	7	.789	not significant $\alpha=.05$

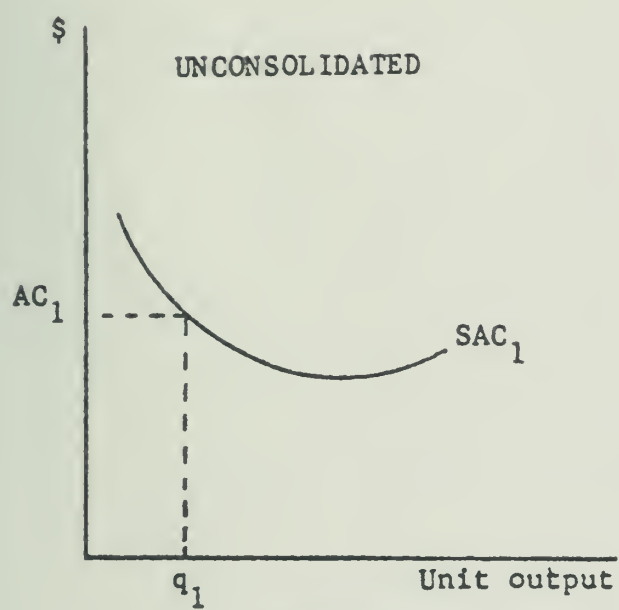


Figure 1a

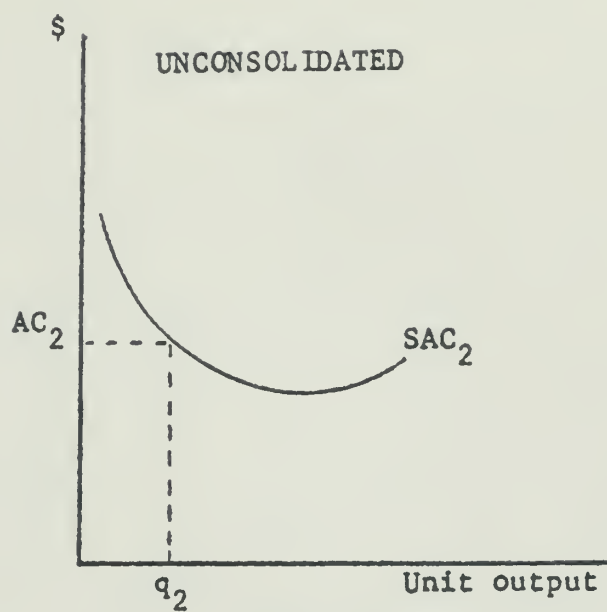


Figure 1b

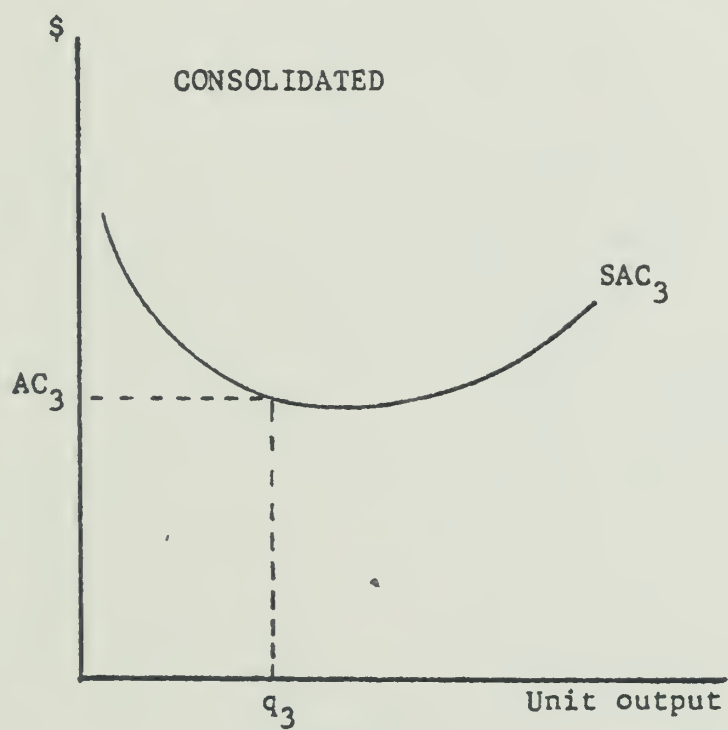
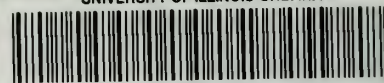


Figure 1c

FIGURE 1

UNIVERSITY OF ILLINOIS-URBANA



3 0112 060296750